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Research Article

Prevalence and Incidence of Major Reproductive Disorders in Dairy Cows and Calf Mortality in Arsi Negele, Oromia Regional State, Ethiopia -

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Abstract

Retrospective and prospective study was conducted in Arsi Negele with the objectives of estimating the prevalence of major reproductive disorders of dairy cow and the possible risk factors in the selected dairy farms. A one year (i.e November, 2016 to late 2017) retrospective study conducted based on owner's information. On the same selected dairy farm prospective study conducted by follow up in two weeks interval to assess reproductive problem in the farm. Major reproductive problem recorded in both study type were Mastitis, abortion, retained fetal membrane, vaginal prolapse, dystocia, anestrus, repeat breeding, endometritis and stillbirth. Among these reproductive disorders both study mastitis, abortion, retained fetal membrane vaginal prolapse and repeat breeding takes the highest proportion in chronological order. In retrospective study calf mortality was assessed and there was 42.9% mortality and the majority of them were at the age of less than one month. And 51.9% of them were crossbreeds the difference was significant ($p < 0.05$) when compared with other age group and breeds. There was also significant difference in reproductive disorder as compared with age group, breed and parity in retrospective study. The type of reproductive disorder during prospective study were similar with that of retrospective. There was no significant variation observed in different months at time follow up. During study period it was observed that there was a problem of information where no one dairy farm had recording system. The record or information about each cow was obtained from direct interview of the attendants or animal owner. There was no sufficient history about feeding, reproductive managements and soon. Therefore, the study revealed that dairy farm practice in the area is almost traditional way. The profitability and reproductive efficiency cannot be evaluated properly unless otherwise dairy farm handled in modern way. Most of the problems reported by the animal owner are a good indicators for its poor efficiency. Hence attention should be given towards creating awareness of the animal owners and other responsible body in order to bring change in the dairy farm sector.

Keywords: Prevalence; Reproductive disorders; Prospective retrospective breeds

INTRODUCTION

Ethiopia has the largest livestock population being the first in Africa and the 10th in the world. However, dairy industry is not developed as that of other east African countries such as Kenya, Uganda and Tanzania [1]. Reproductive and production disorders of dairy cattle significantly reduce their productivity which is a great concern of dairy producers worldwide because most reproductive disorders adversely affect the future fertility. The major problems that have direct impact on reproductive performance of dairy cattle are abortion, dystocia, retained placenta (retention of fetal membrane), metritis, vaginal prolapse, anestrus and repeat breeder. These result in considerable economic loss to the dairy industry due to slower uterine involution, reduced reproductive rate, prolonged inter conception and calving interval, negative effect on fertility, increased cost of medication, drop in milk production, reduced calf crop and early depreciation of potentially used cows [2].

Reproductive efficiency is a critical component of a successful dairy operation, whereas reproductive inefficiency is one of the most costly problems facing the dairy industry today. Reproductive disorders occur frequently in lactating dairy cows and dramatically affect reproductive efficiency in dairy herds. Some of the most common disorders include, twinning, retained fetal membrane, infection of reproductive tract, dystocia, metritis and abnormal health status. These diverse disorders are similar in that they all can result in impaired reproductive function [3]. Therefore the reproductive failure causes great frustration for dairy producers. Diseases of the newborn calf and neonatal calf mortality are other major causes of economic losses in dairy production [4].

Calving can be a traumatic and risky event in the life of a calf. The most common cause of dystocia is excessively large calf birth weight and a resulting incompatibility of fetal maternal size, especially at first calving [5]. The stress effects of a difficult calving greatly increase the risks of illness and death in young dairy calves. Difficult calving contributes almost 50% of all calf deaths [6]. Neonatal calf mortality in the first month of age is accounted to be 84% of the total mortality and is particularly high in the third week of life. Loss due to health care and management cost incurred in delayed age of production.

Deciding whether to breed, treat, or cull dairy cows exhibiting one or more of these reproductive problems is a challenge for both veterinarians and dairy producers. In addition, there is considerable controversy among dairy scientists and bovine practitioners regarding the economic impact of these problems in a dairy operation and the most effective management or therapeutic intervention for treating them. Because of this controversy, dairy managers should focus on prevention and control of risk factors associated with each problem rather than on prescriptive therapeutic interventions. Dairy producers should work closely with their herd veterinarian to develop such management strategies and discuss appropriate interventions when necessary [7].

Therefore, this study carried out to achieve the following objectives:

- To estimate the prevalence of reproductive disorders in dairy cows under different management system in Arsi Negele town using retrospective and prospective study.
- To estimate the prevalence of calf mortality for the last one year.
- To identify the potential risk factors which is responsible for reproductive disorders and calf mortality for the last one year in the study area.

MATERIAL AND METHODS

Study area

This study was conducted in Arsi Negele town located in southeastern Arsi zone, Oromia regional state, Ethiopia from December, 2016 to April, 2017. Arsi Negele town is located at about 228 km South East of Addis Ababa at 38042'N latitude and 702'E longitude. The town is bounded with East Shewa to the North, around Shashamane woreda to the South, Arsi zone to East and southern nations, nationalities and peoples Region to the West.

Study population

The study population were dairy cows and calves in the selected dairy farms in Arsi Negele town. The dairy cows were cross breed,



local and exotic kept under different management system. All cows at reproductive age included in the study and calf crop in selected farm also recorded. During retrospective study parameters like parity numbers, body condition, breed, hygiene, and housing were included in addition to reproductive problems and calf mortality recorded.

Study design

This study was involves a combination of prospective and retrospective types of study designs. The retrospective study focuses on data collection about major reproductive disorders and calf mortalities that had occurred for the last one year in November, 2016 to late 2017. A the prospective study was carried out for five months starting from December, 2016 to April, 2017.

Sample size and sampling procedure

The sample size required for the study was determined based on the technique described by [8] for simple random sampling. Since there are no known previous studies in the study area about major reproductive disorders and considering low number of dairy farm in the area, 20% expected prevalence used to calculate the sample size. The following formula is used to compute the sample size using 20% expected prevalence of reproductive disorders, a desired absolute precision of 5% and 95% confidence interval:

$$n = 1.96^2 \left[\frac{P_{exp}(1-P_{exp})}{d^2} \right]$$

Where,

n = sample size

d = desired level of precision (0.05)

P_{exp} = expected prevalence (20% for reproductive disorder)

Although, the sample size determined were 245, however some of animal owners were not willing to give information as result only 207 cows were used during study period.

Study methodology

Data collection: To collect data on management systems of animals, Owners and attendants were interviewed using structured questionnaire. In the survey, information on reproductive health problems as well as management system and particularly related to individual cow such as parity, breed, age, hygiene and body condition score were collected. The various reproductive disorders were defined and recorded based on the following definitions given for each problem.

Abortion: Abortion is a condition in which the fetus is delivered live or dead before reaching the stage of viability and in which the delivered fetus is generally visible by naked eye [9].

Endometritis: inflammation of the endometrium characterized by reddish brown, white or whitish to yellow mucopurulent fetid vaginal discharge along with thickness of uterine wall detected in trans-rectal palpation [10].

Anoestrus: Lack of expression of the oestrus at an expected time is called anoestrus. Clinically if a heifer is 18 or more months old or a cow has passed 40 days post partum but did not show oestrus the condition is referred as anoestrus [9].

Dystocia: occurs when there is a failure in one or more of the three main components of calving, expulsive forces, birth canal adequacy and fetal size and position [6].

Mastitis: Inflammation of the parenchyma of the mammary gland regardless of the cause. Mastitis is characterized by a range of physical and chemical change in the milk and pathological changes in glandular tissue [11]. The term “mastitis” is an Inflammation of the mammary gland primarily resulting from invasions of pathogenic microorganisms through the teat canal [12].

Still birth: still birth generally refers to birth of a dead fetus; however, in the literature, a broader definition including calves found dead at calving [13].

Repeat breeding: a cow or a heifer that failed to conceive for three or more consecutive services [5].

Vaginal prolapse: the protrusion of the vagina and sometimes with the cervix through the vulva [13].

Retained fetal membrane: Retention of the fetal membrane from 8-12 hrs to greater than 24 hrs is indicative of abnormal condition in most studies cited [14].

Retrospective study: The retrospective study conducted based on the information at dairy farms for the last one year prior to the onset of the study. From the records, data to be collected concerning dairy cows are the age, parity number, management system, breed, body condition score and any occurrence of postpartum problems, while data collected for calves' mortality includes birth date and occurrence of calf mortality over the last one year prior to the onset of the study.

Prospective or follow up study: The selected farms were visited at least twice per month over five months during study period. Reproductive problems observed during study period were recorded in each month and the incidence of reproductive disorder calculated at monthly basis.

Calf mortality

The productivity of cattle depends largely on their reproductive performance and the survival of calves. Calf mortality and associated risk factor were recorded in retrospective study where a last one year information included in the study.

Data analysis

Data collected from retrospective and prospective studies were entered in Microsoft excel spread sheet program. Descriptive statistics were used to summarize the relative percentage of each parturient reproductive disorder. Incidence risk was used to see the association of major reproductive disorder with different potential risk factors. Relative risk was used to see the degree of association of the disease occurrence with the risk factors.

RESULTS

Retrospective study

Retrospective data collection on Major Reproductive Disorders (MRD) in dairy farm showed different prevalence. Nine different types of reproductive problems were recorded in a total of 85 cows. Among these , mastitis was the most frequently occurring reproductive disorder which was recorded in (n = 18,21%) cows followed by abortion (n =16,19%), retained fetal membrane(n = 13,15%),vaginal prolapse(n = 9,11%),repeat breeding(n =7,8%), anestrus and endometritis (n = 5,6%) and the lowest one was a mixed case with mastitis with abortion and vaginal prolapse(n = 4,5%) as shown in table 1.



Reproductive disorder as compared to different risk factors

The sum of reproductive disorder were compared with age, breed, and body condition score, hygiene, parity and housing. Statistical significant association of each risk factor against the reproductive disorder analyzed as shown table 2. In this observation older age group had more reproductive abnormality than young aged cows, exotic breed and multiparous (3 < 4) cow shown statistically significant ($p < 0.05$) difference.

Calf mortality record

In retrospective study number of calves born for the last one year and the number of calves died due to various reason were recorded. Accordingly, 98 calves were born and of these 42 calves (42.9%) have died. Most of them were from cross breed, followed by local and exotic, whereas calves with the age of less than one month died more than the age above one month as shown in table 3.

Prospective or follow up study

During the study period, a total of 207 dairy cows in 14 dairy farms at Arsi Negele town were followed up for five months (December, 2016 to April, 2017) for the incidence of new reproductive disorders. Accordingly, a total of 69 (33.3%) cows were observed to be affected at least by one of the nine major reproductive disorders, during study period. Relatively higher incidence (26%) of mastitis recorded followed by abortion (17%) and retained fetal membrane (12), whereas the lowest incidence (4%) was noted as endometritis as shown in table 4. Reproductive disorders that was observed during five months period shown below in figure 1.

Where there was continuous occurrence of the problem in observed period, there was no significant difference in incidence of reproductive problems during observed months.

DISCUSSION

In the present study 33.3% ($n = 69$) prevalence of major reproductive disorder was in agreement with previous report 35.2% by Ayana and Gudeta [15] and 32.5% in and around Chencha town by Fitsum, et al. [16]. The study indicates low prevalence of reproductive health problems of cows in the study area when compared with 47.7% reported in Borana indigenous by Duguma and Zewdie [17]. And also lower than (39.5%) reported in Horro Guduru by [18]. But, higher than 18.3% which was reported by [19] in Assela town.

Table 1: Types of reproductive disorders occurred and their proportion in dairy cow at Arsi Negele town for the last one year of study.

s/n	Type of reproductive disordersa	No. observed	Proportion
1	Mastitis	18	21
2	Abortion	16	19
3	Anestrus	5	6
4	Endometritis	5	6
5	Dystocia	8	9
6	Repeat breeder	7	8
7	Vaginal prolapse	9	11
8	Retained fetal membrane	13	15
9	Mastitis with other disorders	4	5
	total	85	100

Table 2: Reproductive disorders of dairy cow observed against different risk factor based on retrospective information in selected farm of Arsi Negele town.

Factor	n	RDS	Prevalence	OR	95%[CI]	p-value
Age group						
1 ≤ 3.5	103	29	28	1		
3.5 ≤ 6	64	36	56	3.2	1.6-6.2	0.00
6 ≤ 9	40	20	50	2.5	1.2- 5.4	0.02
Breed						
Local	66	32	48	1		
Cross-breed	105	43	41	0.7	0.3-1.4	0.33
Exotic	36	10	28	0.4	0.2- 0.9	0.04
BCS						
poor	67	30	45	1		
medium	56	29	52	1.3	0.7-2.7	0.44
Good	84	26	31	0.6	0.2- 1.1	0.08
Hygiene						
poor	93	44	47	1		
medium	17	7	41	0.8	0.2- 2.2	0.64
good	97	34	35	0.6	0.3-1.1	0.08
parity						
0 < 3	133	46	35	1		
3 ≤ 4	47	25	53	2.1	1.09-4.22	0.02
4 < 7	27	14	52	2.0	0.8- 4.7	0.09
Housing						
Indoor	116	46	40	1		
Outdoor	91	39	43	1.1	0.7- 1.9	0.64

Table 3: Calf mortality in selected farm in Arsi Negele town.

Factor	n	No. of dead	Prevalence	X2	p-value
Breed					
Local	31	11	35.5	3.9 5	0.05
Exotic	15	4	26.7		
Cross-breed	52	27	51.9		
Age group					
0 ≤ 1 month	53	27	50	3.8 4	0.05
1 ≤ 2 month	27	11	40.7		
2 ≤ 4 month	18	4	22.2		
Sex					
Male	43	20	46.5	0.4 2	0.51
Female	55	22	40		

The difference in the reproductive problems and occurrences of calf mortality in different studies could be due to difference in the study area, breed of animal used, sample size, duration of study period, in the presence or absence of predisposing factor and by the level of management system in the respective farms.

The productivity of cattle depends largely on their reproductive performance and the survival of calves. Calf mortality and mortality are problems of major concern in all countries where cattle are raised. A survey of factors associated with calf mortality in south Caroline dairy herds reversed an average mortality rate of 19.1% in calves from birth to 6 month of age. Mortality to one month of age accounted for 84% the total mortality. In European countries the rate of still born calves ranges from 3% to 7% and the total mortality rate ranges from 9% to 13% of all calves born and in a well managed herds the annual



Table 4: Proportion of reproductive abnormality during study period from Dec.2016 to April 2017 in selected dairy farm at Arsi Negele town.

s/n	Reproductive disorders	Frequency	proportion
1	Mastitis	18	26
2	Abortion	12	17
3	Retained fetal membrane	8	12
4	Vaginal prolapse	6	9
5	Dystocia	6	9
6	Repeat breeder	6	9
7	Endometritis	3	4
8	Anestrus	5	7
9	Still birth	5	7
10	Total	69	100

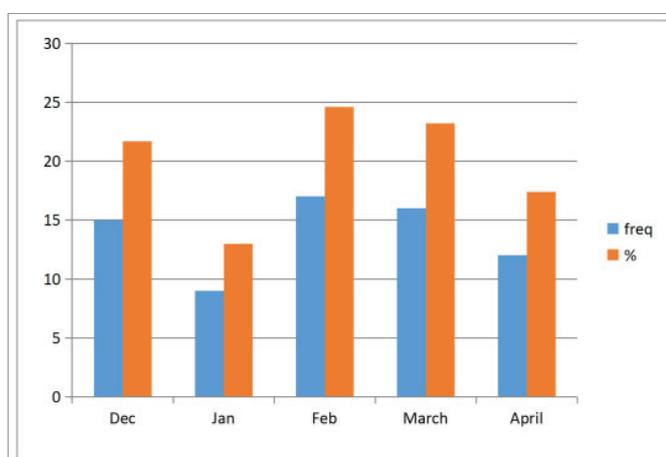


Figure 1: Frequency of occurrence and relative percentage of reproductive disorders within fourteen dairy farms as observed between Dec, 2016 and April, 20.

mortality rates for calves under 30 days of age can controlled at a level below 3% to 5% of all calves born alive and normal [20,21].

The current prevalence of calf mortality was 42.9% which is higher than 11.6%, 9.3% who reported by [22,23], respectively. The calf mortality highest in the cross-breed followed by exotic and local breed in the present study area. Calf health care is generally dependent to a great extent on management and hygiene practices, as majority of calf diseases arises as a result of poor management [24]. Poor management might have contributed for such high calf mortality records in the study area.

Retained fetal membrane is an important reproductive disease that causes considerable losses at farm level and it is one of the most predisposing factors to endometritis. Cows with Retained fetal membrane have poor appetite and reduced milk yield. Their fertility is reduced if meteritis develops. The highest risk in abortion is in heifers and lowest in second parity cows. Incidence of abortion was < 2% when gestation was from 270 to 289 day in length for five dairy breeds but increased markedly outside that range [25]. The present study showed the prevalence of abortion was 17% that not in agreement with the above result.

In the present study prevalence of endometritis is 4%, which is lower than that of reported by [26], who indicated that incidence of meteritis falls in the range between 6.5-10%. In the present study the

incidence rate of dystocia is 9%; this figure is higher when compared with who reported incidence rate ranging between 2.2 to 4.4 % [27].

CONCLUSION AND RECOMMENDATIONS

A herd health program is critical in maintaining reproductive health and identifying potential problems in production and reproduction areas. In general, the cows in the center of Arsi Negele were affected by different reproductive health problems with poor management and production system. Thus, this particular study tried to point out the magnitude of major reproductive problems and their relative importance. According to present study mastitis, retained fetal membrane and repeat breeding are three important reproductive and production diseases. Knowledge in terms of risk factors and their mitigation already available about these diseases should be extended to farmers to control them.

Data Availability

The data used to support the findings of this study are included within the article and can be received from the author on request.

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